TRIP REPORT

FOR
CEDAR CHEMICAL CORPORATION
GROUNDWATER, SOIL, AND SEDIMENT SAMPLING EVENT
WEST HELENA, ARKANSAS

Submitted to:

U.S. Environmental Protection Agency
Region 6
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1.0 INTRODUCTION

Under the Environmental Protection Agency (EPA) Resource Conservation and Recovery Act (RCRA) Enforcement, Permitting, and Assistance (REPA 3) Contract, Work Assignment R06804, Booz Allen Hamilton (Booz Allen) was tasked with the collection of groundwater, soil, and sediment samples at the Cedar Chemical Corporation (CCC) West Helena Plant. Analytical results from these samples were intended for use by the Arkansas Department of Environmental Quality (ADEQ) to assess current contaminant distributions and concentrations.

This trip report documents the sampling activities conducted in accordance with the project-specific quality assurance project plan (QAPP) developed by Booz Allen for EPA, dated August 19, 2005 (Ref. 1). The scope of work included the following activities:

- Collection of 30 groundwater samples
- Collection of 12 soil samples from four soil borings
- Collection of three sediment samples
- Collection of quality control (QC) samples
- Packaging and transfer of the samples to ADEQ personnel for delivery to the ADEQ laboratory for analyses of volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, total metals for groundwater and sediment samples, and total metals and pesticides for soil samples.

Prior to this sampling event, there was a lack of recent data that described site conditions. The most recent soil and groundwater sampling was conducted in 1995 and 2001, respectively. Therefore, the purpose of the field and laboratory activities described in this trip report was to provide ADEQ with data that describes current site conditions. In addition, it was anticipated that these data would be useful in future efforts to make an environmental indicator (EI) determination for the Resource Conservation and Recovery Information System (RCRIS) code CA725 “Current Human Exposures Under Control” and the CA750 “Migration of Contaminated Groundwater Under Control”.

2.0 PROJECT BACKGROUND AND PHYSICAL SETTING

This section provides a description of the location, history, and physical setting of the CCC facility. This description is based upon a review of available information regarding environmental conditions.

2.1 Project Background

The CCC facility is located to the south of Helena and West Helena, Arkansas, on 48 acres of the Helena-West Helena Industrial Park, approximately one and one-quarter miles southwest of the intersection of U.S. Highway 49 and State Highway 242. The facility is bordered by farms, State Highway 242, the Union-Pacific Railway, and other industrial park properties. Residential areas are located within one-half mile to the southwest and northeast of the CCC facility. The location of the CCC facility is illustrated in Figure 1.

The CCC facility is divided into two major areas: the manufacturing area and the wastewater treatment system area. Agricultural and organic chemicals were manufactured within six production units at the facility. Chemical processing at the production units included alkylation, amidation, carbamoylation, chlorination, distillation, esterification, acid and base hydrolysis, and polymerization. In addition to chemical production and processing, plant activities included product formulation and packaging.

In 1972, the facility began dumping waste chemicals into three unlined earthen ponds at the facility. These disposal practices were discontinued in 1977; in 1978, the ponds were closed by dewatering the ponds and installing a clay/bentonite cap. A wastewater treatment system was constructed at the facility in 1977 for treatment of wastewater formerly discharged to the ponds. The wastewater treatment facility remains operational.

Upon completion of a RCRA facility investigation (RFI) (Ref. 5) and risk assessment (Refs. 3 and 4) for the facility, the ADEQ agreed that CCC should proceed to the corrective measure study (CMS) phase of remedial action. However, the process was interrupted by a CCC bankruptcy and the closure of manufacturing operations on March 8, 2002. The site was relinquished to the State of Arkansas and is now under the control of ADEQ.

2.2 Physical Setting and Data Gaps

This section describes the known physical settings of the facility, including the groundwater, soil, and sediment conditions, and provides information on the data gaps addressed by this sampling event. A more detailed summary is provided in the conceptual site model (CSM) (Ref. 2).

2.2.1 Groundwater

The uppermost geologic unit at the facility consists of 150 feet of Quaternary age alluvial deposits. The Sparta Sand aquifer underlies the alluvial deposits, ranges in thickness from 300 to 400 feet, and is comprised of very fine to medium sand with sandy clay. The following three water-bearing units exist at the site:

- A discontinuous perched zone that occurs at 10 and 20 feet below ground surface (bgs) in the upper disturbed soil or fill

- A confined/semi-confined alluvial aquifer that occurs from approximately 30 to 40 feet bgs to approximately 150 feet bgs
- The Sparta Sand/Memphis Sand aquifer system that occurs within the Sparta Sand and Memphis Sand formations at 400 feet bgs.

Groundwater flow direction in the alluvial aquifer is toward the south and southeast. Regional groundwater flow in the Sparta Sand is generally to the southeast toward the Mississippi River.

There are numerous groundwater monitoring wells located both on site and off site; however, these wells were last sampled in 2001. Data collected as part of the 1996 RFI (Ref. 5) and from the most recent groundwater sampling events (Ref. 3) indicate VOC, SVOC, pesticide, and metal detections are above either the Federal Maximum Contaminant Levels (MCLs) or the EPA Region 6 Medium-Specific Screening Levels (MSSLs) for tap water. According to the risk assessment (Ref. 3), the contaminants of concern (COCs) in the perched unit are 4-chloroaniline, 1,2-dichloroethane (1,2-DCA), and methylene chloride; in the alluvial aquifer, the COCs are benzene, chloroform, methylene chloride, 1,2-DCA, 1,2-dichloropropane, and chlorobenzene. 1,2-DCA contamination has been detected consistently across the facility in both the perched and alluvial groundwater zones. Based on the 1996 RFI and 2001 groundwater monitoring data, the 1,2-DCA plume extends from the center of the process area on the north side of the facility to approximately one mile off site and downgradient of the CCC facility. Elevated 1,2-DCA concentrations were reported in off-site monitoring wells and in agricultural wells AGI-1 and BHAG-1. The plume appears to be contained within the facility boundaries to the west and southwest. There appears to be at least two source areas for 1,2-DCA: the northeast side of the plant and the wastewater treatment ponds (Ref. 2).

2.2.2 Soil

As identified in the CSM (Ref. 2), characterization of potential soil impacts at Site 5 [Solid Waste Management Unit (SWMU 72)] is incomplete. Site 5 consists of a concrete drum vault with a sub-floor of gravel, sand, and possibly cement located under the Maintenance Services Building. In 1993, subsurface soil samples were collected beneath the drum vault as part of the Phase I RFI, and dinoseb was detected beneath the vault, which CCC attributed to residual contamination from Site 9. No further action was recommended in the RFI; however, Arkansas Department of Pollution Control and Ecology (ADPCE) did not concur and required additional investigation. Subsequent to developing media-specific cleanup criteria, CCC intended to conduct additional sampling as part of a CMS.

2.2.3 Sediment

The only surface water body on the CCC site is a wetland (AOC 2) located adjacent to the wastewater treatment system. The two-acre wetland was constructed in 1978 to serve as an overflow retention pond for the wastewater treatment system, but was never operated as such. The wetland was identified as an ecological area of concern in the risk assessment (Ref. 3). CCC

maintained that the wetland had not been impacted by contamination from the CCC facility; however, sampling had not been conducted to confirm that sediment and/or surface water at the wetland had not been impacted.

3.0 INVESTIGATION METHODOLOGY

Sampling and soil boring activities were performed at the CCC facility from August 22 through August 26, 2005. Booz Allen field staff were accompanied by Mr. Rick Ehrhart, EPA Work Assignment Manager (WAM), for the majority of the sampling event. In addition, Mr. Jim Riggs and Ms. Dianna Kilburn of ADEQ were present for part of the program and were available to deliver samples to the ADEQ laboratory in Little Rock, Arkansas, as needed. A list of Booz Allen, EPA, and ADEQ personnel present during the sampling event, along with their affiliation, is provided below in Table 1. Mr. Stephens, the owner of adjacent land and the agricultural wells that were sampled as part of the field investigation, was highly cooperative in providing access to his property and installing and operating his pumps for groundwater sampling purposes.

Table 1
Participants in Sampling Event

Name	Affiliation
Bret Kendrick Angela Sederquist Marta Woloszyn Sean Westropp Lucas Kingston	Booz Allen
Rick Ehrhart	EPA Region 6
Jim Riggs	ADEQ
Dianna Kilburn	ADEQ

Prior to commencing the field sampling activities, Booz Allen and EPA representatives selected the sampling locations based on knowledge of facility history and potentially impacted areas. A total of 12 soil, three sediment, and 30 groundwater samples were collected and delivered to the ADEQ laboratory in Little Rock, Arkansas, for analysis. In addition, four field duplicates (three groundwater and one soil), three matrix spike/matrix spike duplicate (MS/MSD) samples (two groundwater and one soil), two equipment rinsate blanks, and two trip blanks were submitted for laboratory analyses. Sample locations are illustrated in Figure 2 and 3. Table 2 provides a list of the locations sampled, matrix and chemical analysis, and sample collection method for each sample. Soil boring logs, field parameter measurements, copies of the field log book notes, photographic documentation, and copies of chain-of-custody (COC) forms are provided in

Attachments A through E, respectively.

Table 2
Summary of Sampling Information

Location	Well/Sample Location	Sample ID	Matrix	Sample Method	Analyses	GPS Coordinates
On-Site Perched Zone	1MW-1	CED1MW-1	Groundwater	Perastaltic Pump	VOCs SVOCs Pesticides Metals	N 34° 31.135' W 90° 39.231'
	1MW-2	CED1MW-2				N 34° 31.097' W 90° 39.291'
	1MW-3	CED1MW-3				N 34° 31.051' W 90° 39.299'
	1MW-4	CED1MW-4				N 34° 31.029' W 90° 39.245'
	1MW-5	CED1MW-5				N 34° 31.064' W 90° 39.200'
	2MW-1	2MW-1				N 34° 31.236' W 90° 39.179'
	2MW-2	2MW-2				N 34° 31.279' W 90° 39.235'
	EMW-6A	EMW-6A		Submersible Pump		N 34° 31.121' W 90° 39.157'
	EMW-6B	EMW-6B		Perastaltic Pump		N 34° 31.119' W 90° 39.159'
On-Site Upper Alluvium	1MW-6	CED1MW-6	Groundwater	Submersible Pump	VOCs SVOCs Pesticides Metals	N 34° 31.028' W 90° 39.245'
	1MW-7	CED1MW-7				N 34° 31.134' W 90° 39.234'
	2MW-3	CED2MW-3				N 34° 31.239' W 90° 39.240'
	2MW-4	CED2MW-4				N 34° 31.233' W 90° 39.179'
	2MW-5	CED2MW-5				N 34° 31.277' W 90° 39.235'
	2MW-6	CED2MW-6				N 34° 31.242' W 90° 39.289'
	4MW-3	CED4MW-3				N 34° 31.191' W 90° 39.035'
	9MW-1	9MW-1				N 34° 31.214' W 90° 39.133'
	EMW-1	EMW-1		Perastaltic Pump		N 34° 31.197' W 90° 39.244'
	EMW-2	EMW-2		Submersible Pump		N 34° 31.300' W 90° 39.176'
	EMW-4B[1]	EMW-4B[1]		Perastaltic Pump		N 34° 31.175' W 90° 39.213'
	EMW-6	EMW-6		Submersible Pump		N 34° 31.121' W 90° 39.158'

Location	Well/Sample Location	Sample ID	Matrix	Sample Method	Analyses	GPS Coordinates
On-Site Lower Alluvium	2MW-7	2MW-7	Groundwater	Submersible Pump	VOCs SVOCs Pesticides Metals	N 34º 31.242' W 90º 39.287'
	4MW-4	4MW-4				N 34º 31.128' W 90º 39.146'
Off-Site and Downgradient Upper Alluvium	OFFMW-2	OFFMW-2	Groundwater	Perastaltic Pump	VOCs SVOCs Pesticides Metals	N34º 30.613' W90º 38.936'
	OFFMW-4	OFFMW-4				N34º 30.634' W90º 39.321'
Off-Site and Downgradient Lower Alluvium	OFFMW-1	OFFMW-1	Groundwater	Perastaltic Pump	VOCs SVOCs Pesticides Metals	N34º 30.612' W90º 38.936'
	OFFMW-3	OFFMW-3				N34º 30.633' W90º 39.321'
	AGI-1	AGI-1		Existing Turbine Pump		N34º 30.599' W90º 39.149'
	AGI-5	AGI-5				N34º 30.919' W90º 38.515'
	AGI-6	AG-6				N34º 30.291' W90º 38.526'
Site 5 (SWMU 72 - drum vault)	CCC-SB-001	CCC-SB-001(0-2)	Surface Soil	Direct Push Technique	Metals Pesticides	Not Available
		CCC-SB-001(16-18)	Subsurface Soil			
		CCC-SB-001(21-23)				
	CCC-SB-002	CCC-SB-002(0-2)	Surface Soil			
		CCC-SB-002(16-18)	Subsurface Soil			
		CCC-SB-002(21-23)				
	CCC-SB-003	CCC-SB-003(0-2)	Surface Soil			
		CCC-SB-003(16-18)	Subsurface Soil			
		CCC-SB-003(21-23)				
	CCC-SB-004	CCC-SB-004(0-2)	Surface Soil			
		CCC-SB-004(16-18)	Subsurface Soil			
		CCC-SB-004(21-23)				
Wetland (AOC 2)	SED-001	SED-001	Sediment	Disposable Scoop	VOCs SVOCs Pesticides Metals	N 34º 31.070' W90º 39.322'
	SED-002	SED-002				N 34º 31.108' W 90º 39.285'
	SED-003	SED-003				N 34º 31.131' W 90º 39.251'

Notes:

1. Two wells were located in this area. Well EMW-4 was damaged and not sampled. The adjacent well, field designated EMW-4B, had a measured total depth of 35.94 feet below top of casing and was sampled.

3.1 Soil Investigation

The soil investigation included soil sample collection from four borings completed at Site 5 (SMWU 72), the former drum vault. The direct push technique (DPT), which uses a pneumatic hammer to advance a sampler through unconsolidated materials, was used to collect relatively undisturbed soil samples from this area of poor accessibility. ETTL Engineers and Consultants, Inc. (ETTL), based in Tyler, Texas, provided the DPT services using a truck-mounted 54GT Geoprobe® rig. The borings, designated CCC-SB-001 through CCC-SB-004, were completed

along the four sides of the Maintenance Services Building. This building is founded on top of the former drum vault.

Soil samples were collected during the advancement of the DPT boring using 2-inch diameter acrylic sample sleeves. Photoionization detector (PID) background and sample measurements were taken at two-foot intervals and recorded on the soil boring log (Attachment A). At each boring, one surface soil sample was collected from 0 to 2 feet bgs, and two subsurface soil samples were collected from 16 to 18 feet bgs and 21 to 23 feet bgs. An accounting of soil boring and sample designations is provided in Table 2. Soil sample homogenization was accomplished by filling a disposable container with soil from the proper sample interval and mixing the sample with a disposable plastic scoop. Following homogenization, one eight-ounce glass jar was collected for laboratory analyses. All equipment was decontaminated prior to use and after completion of each boring. Following sample collection, ETTL personnel filled the borings with granular bentonite and hydrated the bentonite with potable water, in accordance with state and local abandonment requirements.

One soil field duplicate sample of CCC-SB-001 (16-18) was collected and designated CCC-SB-009 (16-18). One additional sample volume was also collected at CCC-SB-001 (16-18) as an MS/MSD sample. All samples were placed in an ice-filled cooler and couriered by ADEQ to the laboratory for analyses of pesticides and total metals.

3.2 Sediment Investigation

The sediment investigation included the collection of three sediment samples from the low-lying area between the equalization ponds and the eastern side of the berm that surrounds the wetland (AOC 2). The samples were designated CCC-SED-001 through CCC-SED-003, as indicated in Table 2. Sample locations are illustrated in Figures 2 and 3.

Following the removal of the upper two inches of surface material, the samples were collected from 0.2 to 0.5 feet bgs using a disposable plastic scoop. One eight-ounce glass jar was collected, placed in an ice-filled cooler, and delivered to the laboratory for analyses of VOCs, SVOCs, pesticides, and total metals.

3.3 Groundwater Investigation

The groundwater investigation included the collection of groundwater samples from 23 on-site monitoring wells, four off-site monitoring wells, and three off-site agricultural wells, as summarized in Table 2 and illustrated in Figures 2 and 3. Three types of groundwater pumps were used during the investigation, as indicated in Table 2:

- Peristaltic pumps (Geotech®) were used in wells where depth to water was less than 25 feet bgs.

- Electrical submersible pump (Grundfos® Redi-Flow 2) was used in wells where depth to water exceeded 25 feet bgs.
- Existing turbine pumps were used in the off-site agricultural wells.

For the peristaltic and submersible pumps, the pump/tubing intake was positioned at the middle of the screened interval if the screen was fully saturated, or a few feet below the water table if less saturated thickness was available. The samples were extracted through teflon-lined polyethylene tubing to a YSI® flow-through cell and then discharged into a five-gallon bucket for disposal. Disposable tubing was used for each well to prevent potential cross contamination. Additionally, the flow-through cell was properly cleaned prior to purging activities to further prevent potential cross contamination. Once the water quality parameters measured during purging had stabilized or three well volumes had been purged, the flow-through cell was disconnected and groundwater samples were collected. A summary of water quality parameters recorded during well purging is provided in Attachment B.

For the turbine pumps installed in the agricultural wells, the high-yield pumps were operated for approximately five to ten minutes prior to sample collection. The samples were obtained from the 14-inch layflat hose that delivers water from the well to the cotton fields. The samples were collected through a 0.25-inch disposable polyethylene tubing that was inserted into the layflat hose approximately 20 to 25 feet from the wellhead.

The sample containers were immediately transferred to a cooler containing ice to preserve the samples prior to packaging and delivery to the ADEQ laboratory. As summarized in Table 2, the groundwater samples were analyzed for VOCs, SVOCs, pesticides, and metals.

Three duplicate groundwater samples were collected. A duplicate sample of OFF-MW-2 was collected and designated as OFF-MW-5. A duplicate sample of 9MW-1 was collected and designated as 9MW-2. A duplicate sample of 4MW-3 was collected and designated as 4MW-5. In addition, extra sample volumes of 2MW-4 and AGI-6 were collected as MS/MSD samples. Two equipment rinsate blanks, RW-1 and RW-2, were collected from the decontaminated submersible pump following sampling at wells 2MW-5 and 1MW-7, respectively.

3.4 Documentation

Soil boring logs are provided in Attachment A. A summary of water quality field parameter data is provided in Attachment B. Booz Allen field personnel recorded all field activities into field log books. Copies of field log book notes are provided as Attachment C. Additionally, photographs were taken during the sampling event and are included as Attachment D. Booz Allen ensured the integrity and security of all samples using stringent chain-of-custody protocols. Copies of the chain-of-custody forms completed by Booz Allen personnel are provided as Attachment E.

3.5 Laboratory Analyses

Environmental samples were packaged and hand-delivered to the ADEQ laboratory by ADEQ representatives. The samples were analyzed for VOCs using SW-846 Method 8260B, for SVOCs using SW-846 Method 8270C, for pesticides using SW-846 Method 8081A, and for total metals using SW-846 Method 6010B/7471A.

4.0 INVESTIGATION-DERIVED WASTE

Investigation-derived waste (IDW) consisted of soil generated from the DPT borings, purge water, decontamination water, disposable equipment (e.g. pump tubing and sampling spoons), and personal protective equipment (PPE). Booz Allen containerized purge water and decontamination water into five-gallon buckets and disposed of the water into the equalization ponds at the on-site wastewater treatment facility. Soil cuttings were containerized and temporally staged on site at a secure location. Following receipt of soil sample analytical results, ADEQ was responsible for disposal of the soil IDW. Used PPE and disposable equipment were double bagged and disposed of in a solid waste dumpster.

5.0 REFERENCES

1. *Quality Assurance Project Plan for Groundwater, Soil, and Sediment Sampling Event at the Cedar Chemical Company*. Prepared by Booz Allen. Dated August 19, 2005.
2. *Draft Conceptual Site Model*. Prepared by Booz Allen Hamilton, 2003. Dated March 21, 2003.
3. *Risk Assessment Addendum*. Prepared by EnSafe, Inc. Dated January 22, 2002.
4. *Risk Assessment*. Prepared by EnSafe, Inc. Dated October 8, 1999.
5. *Facility Investigation Report*. Prepared by Environmental and Safety Designs, Inc. Dated June 28, 1996.

FIGURES

ATTACHMENT A

SOIL BORING LOGS

ATTACHMENT B

WATER QUALITY PARAMETER DATA

ATTACHMENT C

COPIES OF FIELD LOG BOOK NOTES

ATTACHMENT D

PHOTOGRAPHIC DOCUMENTATION

ATTACHMENT E

COPIES OF CHAIN-OF-CUSTODY FORM